

Observations of the Solar Eclipse of 1875, September 28-29, made at the Royal Observatory, Greenwich.

(Communicated by the Astronomer Royal.)

The circumstances of this Eclipse, like that of 1874, October 9, were not favourable for the determination of the corrections to the diameter of the Sun and Moon. On this occasion the magnitude of the Eclipse was only 0.119, the diameter of the Sun being unity. In consequence, observations were made with the Great Equatoreal, with a view only of determining the corrections to the tabular place of the Moon in R.A. and N.P.D., the corrections to the diameters being adopted, as in the reductions of the previous eclipse, from the results of the eclipse of 1870, December 21-22, which were obtained by the same observers.

Taking da = Correction to excess of Moon's R.A. over Sun's R.A.

$d\delta - d\Delta$ = " " " N.P.D. " " N.P.D.

dS = " Sun's semidiameter

ds = " Moon's "

two series of measures were made, the telescope-observations being made by Mr. Christie, and the declination-microscopes read by Mr. Criswick.

(1). Differences of N.P.D. of the upper and lower cusps during about half an hour following the first contact, which show principally the effect of the correction

$$+ da, + dS, + ds.$$

(2). Differences of R.A. of right and left cusps during about forty minutes preceding the last contact, which show principally the effect of the correction

$$+ (d\delta - d\Delta), + dS, + ds.$$

Two resulting equations were formed from these differences by taking the sums of the constituent equations obtained by a comparison of the measured with the tabular quantity, as affected by the symbolical corrections for each of the two series of observations.

The adopted value of dS being $-1''.679$, and of ds being $-0''.492$,

$$da = -10''.83 = -0^s.722$$

$$d\delta - d\Delta = -3''.98.$$

From 14 meridional observations of the Sun from Sep.

tember 13 to October 16, the corrections to the Sun's tabular place were found to be

$$\begin{aligned} \text{in R.A.} &= -0^s.09 \\ \text{in N.P.D.} &= -1''.34. \end{aligned}$$

Combining these corrections with the corresponding results of the Equatoreal observations, the following corrections to the Moon's tabular place are obtained :

$$\begin{aligned} \text{in R.A.} &= -0^s.81 \\ \text{in N.P.D.} &= -5''.32. \end{aligned}$$

Observations of the R.A. and N.P.D. of each cusp were also made by Mr. Downing with the Transit-circle. Treating these in a similar manner to the Equatoreal observations, but adopting $-0''.53$ for the correction to the Sun's semi-diameter determined from a long series of observations with the Transit-circle, and the correction of the Moon's semi-diameter from the results of the eclipse of 1870, December 21-22, observed with the Great Equatoreal, the following corrections are deduced :

$$\begin{aligned} da &= -13''.53 = -0^s.902 \\ d\delta - d\Delta &= -5''.88. \end{aligned}$$

Substituting these values for da and $d\delta - d\Delta$ in the original equations, in addition to those for dS and ds , the following are the resulting corrections to the tabular places of the Sun and Moon :

$$\begin{aligned} \text{Correction to Tabular R.A. of Sun} &= +1''.04 = +0^s.069 \\ \text{,, ,, N.P.D. ,,} &= -0''.23. \\ \text{Correction to Tabular R.A. of Moon} &= -12''.48 = -0^s.832 \\ \text{,, ,, N.P.D. ,,} &= -6^s.11. \end{aligned}$$

Fourteen photographs were taken with the photoheliograph during the eclipse.

The following table contains the observations of the beginning and ending :

Observations of the Beginning of the Eclipse.

	Instrument.	Clock or Chronometer.	Mean Solar Time.				Observer.
			d	h	m	s	
(a)	E. Equatoreal	Earnshaw	28	23	30	7.1	D.
(b)	Altazimuth	Graham 1		23	31	10.8	L.
(c)	Simms 4-in. No. 2	Brockbanks 436		23	30	13.8	A. D.
	6-in. Equatoreal	Webb 5380		23	31	39.3	C. B. N.
(d)	2½-in Altazimuth	Dent 2015		23	30	4.0	J. W. N.

Observations of the Ending of the Eclipse.

	Instrument.	Clock or Chronometer.	Mean Solar Time. d h m s	Observer.
(e)	S. E. Equatoreal	Sid. Standard	29 0 51 16.6	W. C.
(f)	E. Equatoreal	Earnshaw	0 51 16.7	D.
(g)	Altazimuth	Graham 1	0 51 21.6	L.
	Lee Equatoreal	Frodsham 3449	0 51 3.6	G. L. T.
	6-in Equatoreal	Webb 5380	0 50 56.1	C. B. N.
(h)	2½-in Altazimuth	Dent 2015	0 51 2.6	J. W. N.

Notes.—(a) Very tremulous. Power 140. (b) Time recorded uncertain. (c) Power 76. (d) Probably from 10 to 20 seconds late. (e) Power 295. (f) Observed through cloud. (g) The observation was considered good. (h) The last contact may have occurred at the recorded time $\pm 7^s$.

The initials of the Observers, W. C., D., L., A. D., G. L. T., C. B. N., and J. W. N., are those of Mr. Christie, Mr. Dunkin, Mr. Lynn, Mr. Downing, Captain Tupman, Lieutenant Neate, and Mr. Nichol.

Royal Observatory, Greenwich,
1875, November 12.

Partial Eclipse of the Sun, September 28-29, 1875, observed at
Forest Lodge, Maresfield. By Capt. Wm. Noble.

I constricted the aperture of the object-glass of my Equatoreal to 2.3 inches, and observed with a power of 74 and a dark-green eye-shade. The atmospheric undulation was very great indeed. As far as I could determine, the first perceptible indentation on the limb of the Sun occurred at

11^h 57^m 5^s L.S.T. = Sept. 28, 23^h 25^m 49^s L.M.T.

The limb of the Moon was very notably smooth. Before, during, and after the time of greatest obscuration, the Sun's limb appeared to turn *very* slightly outwards—perhaps to the extent of 1" or 1".5—where that of the Moon cut it, giving rise to the effect of two little thorns of light projecting from it. It suggested the idea of very slight refraction of the Sun's light at the limb of the Moon. In order to eliminate anything in the shape of personal equation, and to be certain that this was an actual objective appearance, I got Mr. Noble, and Mr. J. Lister-Godlee of the Equity Bar, successively to view the eclipsed Sun, and to describe what they saw; and in each case the little